

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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FILED : March 14, 1997
GROUP ART UNIT : 2109
EXAMINER :
PATENT NO. : 5,397,857
INVENTORS : Farquhar et al.
TITLE : "PCMCIA STANDARD MEMORY CARD
FRAME"

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**REISSUE APPLICATION
INVENTOR'S DECLARATION AND POWER OF ATTORNEY
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SIR:

I hereby declare that:

1. My residence, post office address and citizenship are as stated below next to my name.

2. I am a co-inventor for U.S. Patent Application Serial No. 92,012 filed July 15, 1993 and which issued as U.S. Patent No. 5,397,857 on March 14, 1995, and for which invention a reissue patent is being solicited.

3. A copy of the reissue application is attached hereto. I reviewed and understand the contents of the specification, including the claims as amended or added by any amendments specifically referred to herein.

4. I acknowledge the duty to disclose information defined in 37 CFR §1.56 which is material to the examination of this

application, namely, information that may affect the patentability of one or more claims in the application.

5. I believe that there is an error in the patent by reason of my claiming less than I had a right, as one of the patentees, to claim in the patent. I believe the original patent to be partly invalid or inoperative because, erroneously, the patent does not include claims such as the newly amended Claim 1 with Claims 2-8 dependent therefrom and newly added Claims 9-13. This error was made unintentionally and with no intention to deceive or mislead the United States Patent and Trademark Office, and, thus, without deceptive intent.

6. I executed an inventor's oath for a patent application which was filed in the United States Patent and Trademark Office. That application was filed on July 15, 1993 and given U.S. Serial No. 92,012. U.S. Patent No. 5,397,857 issued from that application.

7. During an analysis conducted by counsel for me in January and February, 1997 with respect to the claims of U.S. Patent No. 5,397,857, I was informed that, in counsel's review of the claims as well as art cited during the prosecution of U.S. Patent No. 5,397,857, the invention of U.S. Patent No. 5,397,857 can be distinguished over the art in a number of ways not currently claimed in U.S. Patent No. 5,397,857 and not appreciated during the preparation and filing of the application from which U.S. Patent No. 5,397,857 issued. I am informed that, accordingly, it has been determined that amended original Claim

1 and the newly submitted claims, which are listed in Attachment A hereto, and which do not include certain limitations in the original claim, should be patentable over the prior art, and, therefore, the present reissue application is being filed.

8. When I signed the oath submitted with U.S. Patent Application Serial No. 92,012, I did not appreciate that I was entitled to claims such as the newly amended Claim 1 with Claims 2-8 dependent therefrom and newly added Claims 9-13.

9. Specifically, Applicants were and are entitled to claims having a breadth as set forth in newly amended Claim 1 and Claims 2-5.

10. Independent Claim 1 of the '857 patent, as amended, recites "A peripheral device PCB package comprising: two stamped metal covers with a plastic frame element corresponding to each cover, each cover having a first side and a second side with a plurality of fingers extending from said sides and wherein edges of the metal covers are bent to conform to the shape of the frame element and said fingers are embedded in the plastic frame elements forming an integral unit, the plastic frame elements being injection molded around the fingers; and wherein the plastic frame element extends beyond a plane of the metal cover so that a plastic perimeter surface is exposed, thereby facilitating bonding of the two covers."

11. Newly added independent Claim 7 recites A peripheral device PCB package comprising: two stamped metal covers with a plastic frame element corresponding to each cover, each cover

having a first side and a second side with a finger extending from one of said sides of each of the covers and wherein edges of the metal covers are bent to conform to the shape of the corresponding frame element and said finger is secured to the plastic frame element forming an integral unit wherein each of the plastic frame elements is injection molded around the finger; and wherein the plastic frame element extends beyond a plane of the metal cover so that a plastic perimeter surface is exposed, thereby facilitating bonding of the two covers.

12. Newly added Claim 8 depends from newly added Claim 7 and recites that the package has a plurality of fingers extending from at least two sides.

13. Newly added Claim 9 depends from newly added Claim 7 and recites that the package has a plurality of fingers that extend from at least two sides.

14. Newly added Claim 10 depends from newly added Claim 7 and recites that the fingers are embedded in the plastic frame elements.

15. Newly added independent Claim 11 recites a peripheral device PCB package. The package comprises two stamped metal covers having a first side and a second side with a finger extending from one of said sides of each cover. The packages further comprises a plastic frame element associated with each of the covers wherein the plastic frame elements are injection molded to secure the finger of each cover to the plastic frame element.

15. Newly added Claim 12 depends from newly added Claim 11 and recites a package that further comprises a plastic perimeter surface extending beyond the plane of the metal cover to facilitate bonding of the two covers.

16. Newly added Claim 13 depends from newly added Claim 12 and recites a package wherein each of the plastic perimeter surfaces is integrally formed with the plastic frame elements.

17. Newly added Claim 14 depends from newly added Claim 12 and recites that the plastic perimeter surface is an energy director.

18. Newly added Claim 15 depends from newly added Claim 11 and recites that a finger extends from one of said sides.

19. Newly added Claim 16 depends from newly added Claim 11 and recites a plurality of fingers extending from at least two sides.

20. Newly added independent Claim 18 recites a PCB package comprising: a first package half including a stamped metal cover having an edge formed in a U-shape and a frame element injection molded within the U-shaped edge of the metal cover; a second package half including a stamped metal cover and a molded frame element attached to the metal cover; and the first package half sonically bonded to the second package half.

21. Newly added Claim 19 depends from Claim 18 and recites that the first package half includes a plane bisecting the U-shaped edge at its terminal portion on a first side and a second side of the first package half and a plastic perimeter surface

exposed and extending beyond the plane of the first package half to facilitate bonding with the second package half.

22. Newly added Claim 20 depends from newly added Claim 19 and recites that the plastic perimeter surface is an energy director.

23. Newly added Claim 21 depends from newly added Claim 18 and recites that the second package half includes a plane bisecting the U-shaped edge at its terminal portion on a first and a second side of the second package half and a plastic perimeter surface exposed and recessed below the plane of the second package half to facilitate bonding with the first package half.

24. Newly added Claim 22 depends from newly added Claim 18 and recites the edge is secured to the frame element and the frame element is injection molded partially around the edge.

25. Newly added Claim 23 depends from newly added Claim 18 and recites that a finger extends at an angle from the edge of the metal cover and the finger having the frame element partially injection molded around the finger.

26. The package as claimed in Claim 18 wherein the first package half includes a plane bisecting the U-shaped edge at its terminal portion on a first side and a second side of the first package half and a plastic perimeter surface exposed and extending beyond the plane of the first package half to facilitate bonding with the second package half.

27. It was my unintended mistake in the independent claim

as originally filed with the application that the claim could be effectively written to read on the preferred embodiments of my invention in which a finger extends from each of the metal covers wherein each finger is secured to a plastic frame element by injection molding of the plastic frame element around the finger. Therefore, the newly presented claims define an invention disclosed by my original specification and not taught by any reference or combination of references of which I am aware.

28. The error in the originally filed claim which issued on a second Office Action by the U.S. Patent Office arose without any deceptive intention on my part.

A copy of the reissue application is attached hereto. I have reviewed and understand the contents of the specification, including the claims, as amended or added by any amendments specifically referred to herein.

I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith:

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I hereby declare that all statements made herein of our own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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United States Patent [19]

Farquhar et al.

[54] PCMCIA STANDARD MEMORY CARD
FRAME

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[21] Appl No: 92,012

[22] Filed: Jul. 15, 1993

[51] Int. Cl.⁶ H05K 5/03; H05K 7/00

[52] U.S. Cl. 174/52.1; 361/753;
361/575

[58] Field of Search 361/684, 737, 748, 753,
361/752, 757; 174/52.4, 52.5, 52.1; 428/76, 192,
542.8; 156/73.1; 264/248, 272.17

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[57] ABSTRACT

A container for a memory card and the process by which the container is manufactured. The container comprises chiefly two stamped steel covers, (an upper and a lower cover half), each secured to a plastic frame element. The cover halves are secured by extended fingers which wrap around the plastic frame. This provides a double layer of metal at the perimeter of the frame. The two cover halves are situated so as to encapsulate the subject PCB and to affix it in its proper position. The two cover halves are then welded together using sonic welding on the plastic frame. The frame has been designed to meet all PCMCIA standards, including polarizing keys and grounding points.

6 Claims, 4 Drawing Sheets

PCMCIA STANDARD MEMORY CARD FRAME

FIELD OF THE INVENTION

The present invention relates generally to memory media and I/O device containers, and more particularly to a packaging container for printed circuit boards that conforms to standards set by PCMCIA, JEDIC, ISO, etc. for peripheral devices.

BACKGROUND OF THE INVENTION

Current technology computing devices are so small that there is very little room for storage devices such as a hard disk drive or I/O device. In order to expand a portable, laptop, or any other type of computer's capacity and functioning capability, manufacturers have devised "plug-in" peripheral cards in the form of printed circuit boards (PCB's) contained within an exterior package. These devices are termed "PCMCIA style peripheral devices".

The PCMCIA style devices can be used to perform the functions of software, resident memory in hardware devices, or in the place of a hard drive. The cards can be used as flash memory, to facilitate LAN networking, paging devices, and as FAX modems. They may be used in cellular telephones, PROMS, EPROMS, EEPROMS, RAMS, SRAMS, and DRAMS. In short, the cards are very versatile as well as inexpensive.

Due to the myriad methods possible to construct the interface of the memory card with the computer, the Personal Computer Memory Card International Association (PCMCIA) and comparable organizations have established certain standards for the construction of the memory cards within their containers.

Use constraints require that a PCB be sealed within a rigid package for insertion into the PC. One problem in the current art methods of fixing the card in metallic containers is that adhesives, solvents and/or epoxies are generally used to secure the two halves of the container. Since the bonding requires the adhesion of two dissimilar metals, current art processes can lead to functional problems with the card, as well as to failures of the bond.

Another disadvantage is that current art constructions use many components, leading to greater manufacturing cost, and a higher likelihood of failures.

OBJECTS, SUMMARY, AND ADVANTAGES OF THE INVENTION

Accordingly, it is an object of the present invention to provide a PCMCIA style peripheral device container that meets PCMCIA, JEDIC, and ISO standards. It is a further object of the present invention to provide a container that comprises few components to reduce manufacturing cost.

The present invention is a container for a peripheral device and the process by which the container is manufactured. The container comprises chiefly two stamped metal covers, (an upper and a lower cover half), each secured to a plastic frame element. The cover halves are secured by extended fingers which wrap around the plastic frame. This provides a double layer of metal at the perimeter of the frame.

The two cover halves are situated so as to encapsulate the subject PCB and to affix it in its proper position. The two cover halves are then welded together using sonic welding on the plastic frame or resistance welding on the covers. The frame has been designed to meet all

PCMCIA standards, including but not limited to polarizing keys and grounding points

Advantages of the present invention are as follows:

- 1 Joiner of the two package halves is accomplished without the use of adhesives. This leads to greater reliability of the memory card.
 - 2 Very few components are used, minimizing manufacturing costs.
 - 3 More space for the PCB is available within a given package volume.
 - 4 The present invention provides a memory card container that is stronger than prior art containers.
 - 5 The device constructed according to the present invention lends itself to automated assembly.
 - 6 The device of the present invention is very versatile, and can be used for types I, II, III, and IV boards. It is envisioned that future board designs will also be compatible with the present invention.
 - 7 The process will allow a card manufacturer to bond only similar materials, plastic to plastic, since the bonding of the dissimilar materials, plastic to metal, is accomplished by the package manufacturer.
 - 8 Application of a non-conductive layer to the two cover halves prior to stamping allows the package to have a non conductive interior.
 - 9 The design allows the PCB to be fixed in place by opposing plastic elements ("bosses") at any level within the package.
 - 10 The PCB connectors and/or other I/O devices can be clamped between the cover halves.
 - 11 Overall package thickness can be controlled to a very strict tolerance.
 - 12 The package provides variable grounding locations along the length of the package sides.
- These and other objects and advantages of the present invention will become apparent to those skilled in the art in view of the description of the best presently known mode of carrying out the invention as described herein and as illustrated in the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective exploded view of the metal covers and plastic frame of the package of the present invention;

FIG. 2 is a detail view of the plastic frame showing the energy director utilized in the sonic welding process;

FIG. 3 is an exploded front end view of the metal package covers and plastic frame;

FIG. 4 is side cross-sectional view of a memory card and container as embodied by the present invention.

BEST MODE OF CARRYING OUT THE INVENTION

The present invention is a PCMCIA style peripheral device package 10. Referring to FIG. 1, it can be seen that the package 10 comprises chiefly an upper cover 12, a lower cover 14, an upper frame element 16, and a lower frame element 18. The covers 12 & 14 are formed from stamped metal, and the frame elements 16 & 18 are molded plastic.

While the material for the covers is chosen to be stamped metal, there is no requirement that it be so. Any rigid material will suffice. However, if the cover is of a conductive material, it will serve to reduce EMI, RF and ESD problems, these being factors which elec-

tronic devices seek to minimize. It should be further noted that conductive material cannot be eliminated completely as PCMCIA requires a grounding point. The covers 12 & 14 will generally be mirror images of each other, but may not be in certain applications.

An optional addition to the present invention is to coat the interior of the covers 12 & 14 with a thin layer of a non-conductive material. This allows the finished product to have a conductive exterior with a non-conductive interior, thus isolating the conductivity of the interior of the package.

Referring now to FIGS. 2 & 3, a lower energy director 20 extends above one-half of the perimeter upper surface of the lower frame element 18. A corresponding energy director element 22 extends along one-half of the lower perimeter surface of the upper frame element 16. These energy directors 20 & 22 mate with the corresponding frame surface to form the weld during the sonic welding process.

A polarizing key 24 is located at a corner of the lower frame element 18. The polarizing key 24 defines how the PCMCIA style peripheral device mates with the device in which it is being used. The polarizing key is defined for a given use by PCMCIA.

In order to facilitate bonding, the edges of the covers 12 & 14 are bent to conform to the shape of the frame elements 16 & 18. In addition, metal fingers 26 are provided on each side of the covers 12 & 14. The metal fingers 26 become embedded in the plastic frame elements 16 & 18 during the bonding and/or molding process to form an integral frame cover element. This ensures that the two halves of the package can be securely affixed to each other. The covers 12 & 14 being wrapped around the frame elements 16 & 18 also serves to strengthen the package due to the fact that a double layer of metal is formed at the perimeter of the package.

The manufacture of the PCMCIA style peripheral device with its package is accomplished as follows: first, the upper and lower covers 12 & 14 are stamped. The covers 12 & 14 are then mated with the frame elements 16 & 18. This is accomplished by injection molding. The covers 12 & 14 are placed into a mold, where they are "self-secured" in position. The self-securing is accomplished by the geometry and dimensions of the covers 12 & 14. The covers 12 & 14 are stamped to be slightly wider than the mold. Thus the covers are slightly sprung when they are placed into the mold, and remain in the proper position for the injection process. Certainly there is no requirement that the covers be self-secured in the mold. Any means of securing will suffice.

The plastic frame elements 16 & 18 are then shot into the mold. As the plastic frames are molded, the metal fingers 26 on the covers 12 & 14 become embedded in the frame elements 16 & 18 so that separation of the covers 12 & 14 from the frame elements 16 & 18 cannot take place. The end result of the molding process is that the covers 12 & 14 have a metal surface exposed at their sides to create a grounding point when bonded together. Further toward the interior of the unit, the plastic energy directors 20 & 22 are also exposed to facilitate bonding.

One aspect of using an injection molding process is that injection molding requires that ejector pins 17 be provided on the frame elements 16 & 18. In the present invention, the ejector pins 17 are also used to position a PCI 28 that is to be packaged in the package 10. The

pins 17 provide a supporting surface for the PCB 28 which can be adjusted to any height desired for a particular application. Thus an element necessary for the injection process becomes a key for the positioning of the board in the package. Positioning of the PCB is therefore accomplished easily and at minimal additional cost.

The energy directors 20 & 22 are then sonic welded to the opposing plastic frame element so that the upper frame element 16 is permanently bonded to the lower frame element 18, both of which encase the PCB 28.

Thus the covers are secured to the frame elements, which in turn are welded to each other. This ensures that the memory card package will be very reliable and durable, and that the package height is controlled.

It should be noted that it is envisioned that the bonding process between the cover elements may also be performed by resistance welding.

A further option is to inject a foam into the interior of the package which would crystallize and act as an insulator or a heat sink.

It should also be noted that in practice, a card manufacturer will receive the two cover halves ready for welding, and will be the supplier of the board. Because the package has a modular design, it will accommodate many different connectors. Further, because the package manufacturer has accomplished a secure bonding of dissimilar materials, the metal covers bonded to the plastic frame, the bonding required by the card manufacturer is a simple process involving only bonding of like materials, i.e. plastic to plastic sonic welding.

The above disclosure is not intended as limiting. Those skilled in the art will readily observe that numerous modifications and alterations of the device may be made while retaining the teachings of the invention. Accordingly, the above disclosure should be construed as limited only by the metes and bounds of the appended claims.

We claim:

1. A peripheral device PCB package comprising: two stamped metal covers with a plastic frame element corresponding to each cover; each cover having a first side and a second side with a plurality of fingers extending from said sides and wherein edges of the metal covers are bent to conform to the shape of the frame and said fingers are embedded in the plastic frame elements forming an integral unit, the plastic frame elements being injected molded around the fingers;

and wherein the plastic frame element extends beyond the plane of the metal cover so that a plastic perimeter surface is exposed, thereby facilitating bonding of the two covers.

2. The package as claimed in claim 1 wherein: ejector pins on the plastic frames are provided to position a PCB.

3. The package as claimed in claim 1 wherein: the plastic frame elements include a polarizing key.

4. The package as claimed in claim 1 wherein: the plastic frame elements include energy directors.

5. The package as claimed in claim 1 wherein: a grounding point is established by metal-to-metal contact of the covers.

6. The package as claimed in claim 1 wherein: the interiors of the covers are coated with a thin layer of non-conductive material.

1. A peripheral device PCB package comprising:
two stamped metal covers with a plastic frame element corresponding to each cover, each cover having a first side and a second side with a plurality of fingers extending from said sides and wherein edges of the metal covers are bent to conform to the shape of the frame element and said fingers are embedded in the plastic frame elements forming an integral unit, the plastic frame elements being injection molded around the fingers; and wherein the plastic frame element extends beyond [the] a plane of the metal cover so that a plastic perimeter surface is exposed, thereby facilitating bonding of the two covers.

7. A peripheral device PCB package comprising:
two stamped metal covers with a plastic frame element corresponding to each cover, each cover having a first side and a second side with a finger extending from one of said sides of each of the covers and wherein edges of the metal covers are bent to conform to the shape of the corresponding frame element and said finger is secured to the plastic frame element forming an integral unit wherein each of the plastic frame elements is injection molded around the finger; and wherein the plastic frame element extends beyond a plane of the metal cover so that a plastic perimeter surface is exposed, thereby facilitating bonding of the two covers.

8. The package as claimed in Claim 7 wherein a plurality of fingers extend from one of said sides.

9. The package as claimed in Claim 7 wherein a plurality of fingers extend from at least two sides.

10. The package as claimed in Claim 7 wherein the fingers are embedded in the plastic frame elements.

11. A peripheral device PCB package comprising:

two stamped metal covers having a first side and a second side with a finger extending from one of said sides of each cover; and

a plastic frame element associated with each of the covers wherein the plastic frame elements are injection molded to secure the finger of each cover to the plastic frame element.

12. The package as claimed in Claim 11 further comprising:

a plastic perimeter surface extending beyond the plane of the metal cover to facilitate bonding of the two covers.

13. The package as claimed in Claim 12 wherein each of the plastic perimeter surfaces is integrally formed with the plastic frame elements.

14. The package as claimed in Claim 12 wherein the plastic perimeter surface is an energy director.

15. The package as claimed in Claim 11 wherein a finger extends from one of said sides.

16. The package as claimed in Claim 11 wherein a plurality of fingers extend from at least two sides.

17. The package as claimed in Claim 11 wherein the edge of the metal cover is bent to conform to the shape of the plastic frame element.

18. A PCB package comprising:

a first package half including a stamped metal cover having an edge formed in a U-shape and a frame element injection molded within the U-shaped edge of the metal cover;

a second package half including a stamped metal

cover and a molded frame element attached to the metal cover; and the first package half sonically bonded to the second package half.

19. The package as claimed in Claim 18 wherein the first package half includes a plane bisecting the U-shaped edge at its terminal portion on a first side and a second side of the first package half and a plastic perimeter surface exposed and extending beyond the plane of the first package half to facilitate bonding with the second package half.

20. The package as claimed in Claim 19 wherein the plastic perimeter surface is an energy director.

21. The package as claimed in Claim 18 wherein the second package half includes a plane bisecting the U-shaped edge at its terminal portion on a first and a second side of the second package half and a plastic perimeter surface exposed and recessed below the plane of the second package half to facilitate bonding with the first package half.

22. The package as claimed in Claim 18 wherein the edge is secured to the frame element and the frame element is injection molded partially around the edge.

23. The package as claimed in Claim 18 wherein a finger extends at an angle from the edge of the metal cover and the finger having the frame element partially injection molded around the finger.